COMMENTS ON POLICY IMPLICATIONS

D. Allan Bromley
Sterling Professor of the Sciences
Yale University, New Haven, Connecticut

INTRODUCTION

Weather forecasting and prediction's beginnings are lost in the mists of history, where they were within the purview of shamans and priests, and they were certainly highly subjective.

The first real attempt at an objective analytical weather prediction was that of Lewis Richardson, an English Quaker, educated at Bootham College and then at Cambridge, where he had the privilege of working with J.J. Thompson, the discoverer of the electron, and the person generally credited with initiating the 20th century in science and technology.

In 1916, Richardson joined the British Friends Ambulance Unit in France and by the winter of 1917, was bored out of his wits, in the mud and other horrors of that war all around him. With only pencil, paper, a slide rule, and a bale of hay for a desk, Richardson undertook to use the principles of physics to predict or, in actual fact, postdict the weather over central Europe for a six hour period. Although he did not succeed, he laid the foundation for objective science-based weather prediction.

He was able to do this only because, on May 20th, 1910, the day that he selected for his study, a reasonably complete set of observational data had been collected from a coordinated set of balloon flights over most of Europe. Then and now, large quantities of data are the essential input to any weather or climate forecasting activities.

NEW DEVELOPMENTS

The major new opportunities in this field reflect three vitally important developments, in recent years, that vastly increased the number quality, and utility of weather data on a world wide basis. New optical satellite-borne measurement systems now provide atmospheric data over the entire planet. One such system can return a stream of data larger that the entire contents of the Library of Congress in less than five days! Enormously increased data transmission bandwidths allow such data to be transmitted and exchanged worldwide for analysis. Dramatic increases in the power and speed of our supercomputers have made it possible to convert this huge data flow into significant information accessible to us humans.

CURRENT ACTIVITIES

Relationships between the federal government and the private sectors in the US are now loosely defined and changing very rapidly.

Our government accepts taxpayer-supported responsibility for providing the very expensive infrastructure for observation and communication of weather information and for the issuance of weather and climate forecasts. We have now spent substantially more than $600 million per year on satellites alone and have just completed a $4 billion modernization of the network that connects our radar and automatic weather information processors. The federal government also maintains the archives of historic weather and climate data and conducts a substantial part of the relevant research under the auspices of such federal and private organizations as the National Oceanographic and Atmospheric Administration (NOAA) and the National Center for Atmospheric Research (NCAR). Traditionally, our government has provided the output of their systems to the private sector at no cost. It is important to emphasize that the recent Stiglitz Report of the US Communication Industry Association very strongly advocates continuation of this arrangement. In short its fundamental recommendation for the communication industry is that the government should not do what can be done by the private sector.

Unfortunately it is not that simple. Our public looks to the government for a reliable prediction of extreme weather, hurricanes, tornadoes, floods, and the like and expects the government to respond effectively to such extreme events. In order to be able to do this, however, and also because of its own national security needs the government must first prepare general weather forecasts. It is not at all obvious that once available these should be kept from the taxpayers who supported both the collection and analysis of the underlying data in order to avoid competition with the private sector. There is a potential here for substantial confusion and friction and the time has come where we can no longer allow the overall system to grow on its own without some degree of agreement between public and private sectors.

INTERNATIONAL ASPECTS

Currently the US federal government represents both private and public weather services in all international negotiations and agreements under the World Meteorological Organization (WMO) but quite different arrangements have evolved in Japan and in Europe. For example, in Japan, the government has turned over much of its traditional responsibilities to the private sector, while in Europe, governments have largely attempted to control all aspects of weather and climate forecasting.

In Japan the private sector, led aggressively by Hiroyoshi Ishibashi and his company, Weather News Inc. with some $100 million in annual revenues and with branches around the world, has demonstrated unequivocally that

there is a major world market for private weather and climate forecasts. Much of Ishibashi's success has followed from the fact that he provides forecasts finely tuned to the needs of specific customers. He tells 7-Eleven when to stock particular brands of beer since sales are strongly dependent on humidity and temperature and he provides Disneyland (Japan) with forecasts of wind velocity to plan its fireworks displays. The list goes on throughout the Japanese society. In order to provide such detailed specific forecasts Weather News Inc. has made major infrastructure investments in computers, data networks, and private data collection systems, now including private satellites. Ishibashi has found it advantageous to station members of his own company within his major customers' organizations to provide real-time knowledge-based communication of their forecast needs.

Under Ishibashi's urging the Japanese government has developed an effective public/private cooperation that makes economic sense for both.

In Europe, in contrast, the governmental agencies have generally been much more reluctant to relinquish their control over both the production and dissemination of weather and climate forecast data. These policies flow from the fact that many European governments offer forecast data for sale on a commercial basis.

In the US the public/private situation is somewhere between those in Japan and in Europe. Most private US meteorological companies have been largely satisfied to disseminate weather and climate forecasts and to provide additional details to them but have not as yet attempted to provide more detailed forecasts for individual customers, except in special cases. This situation should change in response to the fact that the market for private forecasts is growing very rapidly in the US – from $200 million in 1990 to over $500 million last year according to industry estimates.

All aspects of the system in the US are changing rapidly. Since universities, for example, have set up local observation systems and are offering to provide detailed tuned forecasts to local customers. In a joint project with Taiwan, the University Corporation for Atmospheric Research (UCAR) is expanding their data collection capability through operation of the COSMIC satellite system. Again we have a situation where in the absence of some national policy and hopefully minimal regulation there is the potential for substantial confusion and wasted resources.

A very important element, internationally, is the dramatic growth of use of the internet and the world wide web for disseminating weather forecast data to the public. This markedly reduces any regional or national barriers to the free flow of such information. A recent survey by the Pew Research Center for the

People and the Press found that within the US people go to the internet more often for weather news than for any other topic – including business and entertainment. This is a clearly accepted public good and any reduction of this availability will be unacceptable to the American public.

OPEN QUESTIONS

There are many fundamental questions looming, both nationally and internationally – hence this meeting. Among them are the following:

a) How should the cost of infrastructure be allocated?

b) How, if at all, should the public/private sharing of analyses and dissemination costs be regulated and shared?

c) In the international arena, under the umbrella of the WMO, will it continue to be appropriate for the US government to represent both public and private interests?

d) Again in the international arena, will it be possible for the WMO to harmonize the quite different US, Japanese, and European views of their public/private relationships in weather forecasting and dissemination of the results?

CONCLUSION

We are in a phase of very rapid evolution of the structure of weather and climate forecasting world wide and in particular evolution of the relationship between federal governments and the private sector. In any such rapidly changing situation, there are obvious difficulties but also opportunities. The AMS can play a very important role in the forthcoming discussions by pointing out what these problems and opportunities are and making suggestions concerning their resolution and exploitation, respectively.